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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/812,947

03/31/2004

Seikoh Yoshida

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10/06/2006

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EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 10/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/812,947

Applicant(s)

YOSHIDA, SEIKOH

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 March 0104.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 3/31/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. This office action is in response to the application filed March 31, 2004.

#### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

#### ***Drawings***

3. Figure 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. Claims 1-3 and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moku et al. (Japanese Publication No. 2003-059948-Translation) in view of Applicant's Prior Art.

In regards to claim 1, Moku et al. ("Moku") discloses the following:

a) a substrate (1) (For Example: Figure 1);

b) a semiconductor layer structure including a buffer layer (2) structure, a channel layer (10) that are consecutively formed in this order on said substrate;

c) buffer layer structure includes at least one first buffer layer (9) comprising as a main component thereof a compound semiconductor expressed by the general formula of  $\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{As}_u\text{P}_v\text{N}_{1-u-v}$  (where  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ ,  $x+y \leq 1$ ,  $0 \leq u < 1$ ,  $0 \leq v < 1$ ,  $u+v < 1$ ); and at least one second buffer layer (8) comprising as a main component thereof a compound semiconductor expressed by the general formula of  $\text{Al}_a\text{In}_b\text{Ga}_{1-a-b}\text{As}_c\text{P}_d\text{N}_{1-c-d}$  (where  $0 \leq a \leq 1$ ,  $0 \leq b \leq 1$ ,  $a+b \leq 1$ ,  $0 \leq c < 1$ ,  $0 \leq d < 1$ ,  $c+d < 1$ ) and wherein said first buffer layer and said second buffer layer have different bandgap energies, and have two-dimensional electron gas density or densities therein not greater than  $5 \times 10^{12} \text{cm}^{-2}$  (Note: For Example: See Page 5 of 10 Paragraphs 16-18)(Note: Although Moku fails to specifically disclose that the first buffer layer and said second buffer layer have different bandgap energies, and that the two buffer layers have two-dimensional electron gas density or densities therein not greater than  $5 \times 10^{12} \text{cm}^{-2}$ , the same material is utilized in Moku as in Applicant's invention therefore it would have the same characteristics).

In regards to claim 1, Moku fails to disclose the following:

a) a donor layer.

However, Applicant's Prior Art discloses a donor layer (15) (For Example: See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Moku to include a donor layer as disclosed in Applicant's Prior Art because it aids in the formation of a lateral FET (For Example: See Column 2 Lines 14-23).

Additionally, since Moku and Applicant's Prior Art are both from the same field of endeavor, the purpose disclosed by Applicant's Prior Art would have been recognized in the pertinent art of Moku.

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In regards to claims 2 and 7, Moku discloses the following:

a) the first buffer layer has a thickness of not less than .5nm and not greater than 20nm, and said second buffer layer has a thickness of not less than .5nm and not greater than 20nm (For Example: See Page 2 of 10 Paragraph 9)(Note: In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. See MPEP § 2144.05.).

In regards to claims 3 and 8, Moku discloses the following:

a) the second buffer layer has bandgap energy greater than a bandgap energy of said first buffer and has an Al composition not less than a thickness of not less than .5 and a thickness not less than 1 nm and nor greater than 10nm (For Example: See Page 2 of 10 Paragraph 9, Page 2 of 5 Paragraph 35, Page 8 of 10 Paragraph 34)(Note: In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. See MPEP § 2144.05.).

In regards to claim 6, Moku discloses the following:

a) buffer layer structure includes a plurality of said first buffer layers and a plurality of second buffer layers which are alternately laid on one another (For Example: See Figure 1).

### ***Allowable Subject Matter***

6. Claims 4, 5, 9 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is an examiner's statement of reasons for allowance:

In regards to claims 4 and 9, the prior art fails to disclose the following: a) the first and second buffer layers comprise one of Mg, Be, Zn and C in an amount of not less than  $1 \times 10^{16} \text{ cm}^{-3}$  and not greater than  $1 \times 10^{16} \text{ cm}^{-3}$ .

In regards to claims 5 and 10, the prior art fails to disclose the following: a) an operating current of not less than 1 ampere or an operating voltage of not less than 100 volts.

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Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

8. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: a) *Photoluminescence Characterization of P-Type GaN:Mg* by Corlatan et al.; b) Tsuchiya et al. (Japanese Publication No. 2002-050758) discloses a compound semiconductor epitaxial wafer and transistor; c) Furukawa (Japanese Publication No. 2001-274376) discloses a low resistant gallium nitride group buffer layer; d) Maeda et al. (Japanese Publication No. 2001-326232) discloses a semiconductor device; e) *Growth of High-Performance GaN Modulation Doped Field Effect Transistors by Ammonia Molecular Beam Epitaxy* by Tang et al.; and f) *Reproducibility of Growing AlGaIn/GaN High-Electron-Mobility-Transistor Heterostructures by Molecular-Beam Epitaxy* by Tang et al.

### ***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization

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where this application or proceeding is assigned is 571-273-8300 for regular and after final communications.

ML

July 23, 2006

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke extending to the right.